Cold dysesthesia: a symptom of extramedullary tumors of the spinal cord

ROBERT A. BEATTY, M.D.
Department of Neurology and Neurological Surgery, University of Illinois College of Medicine, Chicago, Illinois

Two cases of cold dysesthesia associated with extramedullary cervical spinal cord tumors have been used to introduce a discussion of related cases and theories. It is postulated that extramedullary pressure on the relatively mobile cervical spinal cord caused the disagreeable sensations when the neck was flexed or extended.

The association of apparently spontaneous icy sensations on the trunk or extremities with extramedullary cervical spinal cord tumors has long been regarded as a clinical curiosity but has never been explained adequately. Haymaker has written that a "common complaint" of patients with extramedullary tumors in the region of the foramen magnum is a sensation of intense cold in one or more limbs. Recently, however, Stein, et al., did not report coldness in their analysis of 25 foramen magnum meningiomas. Elsberg, in his monograph on spinal cord tumors, noted icy sensations in only 2 of 100 patients; one had an extramedullary tumor lying ventrolateral to the lower cervical cord and the other had an intramedullary gliosarcoma at the fifth cervical level. Elsberg and Strauss later wrote that they had not encountered cold sensations in any tumors except those high in the cervical cord. The sensations were most often distributed in the contralateral leg.

Our observations of two patients experiencing this dysesthesia form the basis of this report. We have attempted to explain the curious association of coldness with cervical cord tumors.

Case Reports

Case 1

In 1965 this 49-year-old woman began experiencing left posterior cervical pain without radiation into the arms. This was treated elsewhere unsuccessfully with cervical traction. A year later she developed heaviness of the left arm and, in the spring of 1967, difficulty threading a needle. Soon thereafter she noticed a pricking sensation of the left hand. Ice cold sensations of both hands and forearms became bothersome during the summer, and in the 102°F heat of July were accompanied by piloerection of the forearms. They became so intense that she wrapped her arms in elastic bandages and cultivated the friendship of people with heated swimming pools. Objects she touched, especially silverware, felt cold and elicited pain. Her fellow bridge players noticed that her hands and forearms were blue, damp, and cold to touch. Finally, the left hand became weak, especially the thumb, and the lateral three digits of both hands, left more than right, became numb.

Examination. There was weakness of the left hand grasp, hyperactive deep tendon re-
flexes of the left biceps, left triceps, left brachioradialis, and left pectoralis. There was a left Hoffman reflex, while Babinski signs and abdominal reflexes were absent. Sensory modalities including tactile, pain, vibratory, position, temperature, graphesthesia, and stereognosis were entirely normal in all four extremities. Cervical spine films, skull films, and a radioactive brain scan were all normal. A cervical myelogram demonstrated an intradural, extramedullary 2.7 cm rounded defect at the C2–3 level, anterior and slightly to the left of the spinal cord. The spinal fluid protein was 79 mg%, Pandy test was slightly positive, the colloidal gold curve was normal, and the cell count was zero. The Queckenstedt maneuver showed a slow rise and an imperceptible fall.

**Operation.** An intradural, reddish-gray tumor measuring 1.5 × 1.5 × 2 cm lying anterior to the left of the spinal cord was removed. The tumor was attached to the first cervical anterior nerve root; microscopically it proved to be a neuroma.

**Postoperative Course.** Immediately upon awakening from the general anesthetic, the patient noticed that the icy dysesthesia had disappeared. She was examined 1 year later and was found to have no abnormal neurological signs except bilateral Hoffmann responses.

**Case 2**

In May, 1960, this 62-year-old woman noticed the gradual onset of "stiffness" of all four extremities. She was confined to bed and experienced difficulty voiding. There was pain in the neck posteriorly radiating down both arms. A prominent complaint during the summer was the sensation of periodic waves of intense cold sweeping down over the entire body. They were occasionally interpreted as pain and were so severe they kept her awake.

**Examination.** In December, 1960, she was admitted to the Neuropsychiatric Institute of the University of Illinois. She was markedly debilitated and lay with the head tilted to the right. There was slight movement of the fingers and toes. Atrophy of the shoulder girdle musculature and the intrinsic muscles of the hands was prominent. Abdominal reflexes and Babinski signs were absent. The deep tendon reflexes were hyperactive in the arms but diminished in the legs. Although temperature sense was not recorded, vibratory sensibility was diminished in the entire left leg and arm. Position sense was normal, but perception of pinprick was diminished in a rather spotty distribution on the left arm and left side of the neck. Cervical spine and skull films were normal. The opening pressure on lumbar puncture was 90 mm; the Queckenstedt maneuver demonstrated a slow rise and fall. The Pandy test was 1+, the spinal fluid protein was 109 mg%, serology was negative, colloidal gold curve was normal, and the cell count was zero. A cervical myelogram showed a complete block of contrast material at C-2.

**Operation.** A meningioma, which lay anterior on the right side of the cervical cord at C-2 and extended 2 cm above the foramen magnum, was partially removed. There appeared to be a broad attachment to the dura mater anterior to the medulla.

**Postoperative Course.** On the 9th day after operation the patient was able to stand with help. However, on the following day she had a massive intraperitoneal hemorrhage which caused death several days later. A post-mortem examination revealed a 3 cm remnant of tumor compressing the upper cord and medulla ventrally on the right. Microscopic sections of the spinal cord and medulla disclosed no tract degeneration. An incidental finding was a 4.2 × 6.1 × 1.3 cm left outer third sphenoid wing meningioma.

**Discussion**

Whether the association of cold dysesthesias and extramedullary tumors of the cervical spinal cord is merely a coincidence should be questioned. Certainly, the relative lengths of the cervical, thoracic, and lumbo-sacral spinal cord segments cannot explain the association nor can the incidence of extramedullary tumors at the various segments. Gautier-Smith7 has shown in a review of spinal neurofibromas that thoracic and lumbo-sacral intradural tumors are six times more common than cervical tumors. Russell and Rubinstein18 have noted that the thoracic region is far more often involved than other levels in patients with spinal meningiomas. A similar distribution of these two types of tumor was shown by Rasmussen et al.,14 in their extensive study.

Robert A. Beatty

J. Neurosurg. / Volume 33 / July, 1970
Cold dysesthesia

When thermal sensations do occur the tumor usually lies anterior or anterolateral to the cervical spinal cord, a finding which cannot be explained by an increased incidence of tumors in this circumferential location. On the contrary, tumors lying posterior or posterolateral to the spinal cord far outnumber those lying anteriorly.\(^5\)\(^1^9\) Thus, there is evidence suggesting that uniqueness of the anatomy or physiology of the cervical spinal cord or its coverings is responsible for cold dysesthesia in patients with tumors.

Although stimulation experiments have been carried out at various levels in the nervous system, few of them have mentioned thermal sensations. \(^\text{Mark, et al.}^5\) reported only sensations of tingling and numbness in stimulations of the ventral posterior thalamic nucleus. However, Bertrand and associates\(^4\) noted occasional burning or warmth, but rarely cold, when they stimulated posterior to the thalamic target used to arrest parkinsonian tremor. Stimulations of the spinal cord\(^2^0\) and the cerebral cortex\(^1^3\) have also elicited infrequent and inconstant thermal responses. Recent stimulation experiments of the parafascicular nucleus of the thalamus, a thalamic relay for the multisynaptic spinoreticular system, have produced disagreeable but not thermal or painful sensations.\(^1^0\)

When the dorsolateral tegumentum of the midbrain is stimulated, a variety of dysesthesias, including coldness, is elicited.\(^1^1\)

Surgical tractotomies at different levels of the nervous system have rather consistently failed to produce coldness in the resulting anesthetic areas. However, burning, aching, and a feeling of deadness have at various times been reported following spinothalamic tractotomy in the spinal cord,\(^2^4\) dorsal column cordotomy,\(^5\) spinal trigeminal tractotomy,\(^1^7\) intramedullary spinothalamic tractotomy,\(^2^9\) and mesencephalic tractotomy.\(^2^1\)

The difficulty in adapting these studies to the present discussion is that the emphasis has quite appropriately been on pain.

Noordenbos\(^1^2\) has cogently argued that dysesthesias occur when a lesion anywhere along the afferent pathway causes a greater loss, either actual or functional, of the fast-conducting, phylogenetically recent, spinothalamic fibers than the older, multisynaptic afferent system. This phenomenon, which he calls "fiber dissociation," is thought responsible for hyperesthesias. The presumption is that under normal circumstances the fast-conducting myelinated fibers exert an inhibiting influence on the "unmyelinated" slow-conducting fibers which are transmitting impulses interpreted as primitive, poorly localized, disagreeable sensations. When inhibition is lost, the characteristics of fiber dissociation predominate, i.e., delay, overshooting, after-reaction, and irradiation.

One difficulty in adapting cold sensations to this theory is that the exact pathways for temperature appreciation are unknown. In peripheral nerves both C unmyelinated fibers and small gamma-delta myelinated fibers conduct pain, temperature, and touch.\(^2\) The findings of several modalities within a common group of fibers would appear to compromise the idea of specific fiber sizes for each sensory modality. Similarly, in the spinal cord the temperature pathways are thought to intermingle in the spinothalamic tract with pain and touch fibers.\(^4\) However, there are probably temperature pathways in the older multisynaptic afferent system which persist in man\(^2\) and which may transmit disagreeable thermal sensations.

If one accepts the notion of Riddoch\(^1^5\) that the distinction between spontaneous and evoked sensations is artificial because all sensations result from stimulation, then the distinction between spontaneous dysesthesias and evoked paresthesias as defined by Wilson\(^2^5\) is also artificial and may merely reflect a failure to discover the stimulus.

The stimulus in our cases is not obvious. However, we propose that pressure on the spinal cord is the stimulus and that the relative mobility of the cervical spine is the significant factor.

Although our patients did not specifically associate neck movements with dysesthesias, Case 1 did note that general activity was present. While tumors are more common at the thoracic and lumbar levels, they are seldom associated with dysesthesias. The relative immobility of the spine at these segments may account for this. Any uniqueness of the cervical spinal cord itself seems a less likely explanation than the mechanical one proposed. The similarity between our cases and those with Lhermitte's sign is noteworthy.

This theory is supported by the observa-

\(\text{J. Neurosurg. / Volume 33 / July, 1970}\)
tions of Waltz who has demonstrated the remarkable changes in the longitudinal and cross-sectional dimensions of the cervical cord and canal when the neck is flexed and extended. In extension, particularly, the cross-sectional area of the cord increases 9% to 17% by longitudinal folding of axon cylinders upon one another. In addition, the transverse area of the spinal canal diminishes in extension by 11% to 16% due to infolding of the ligamentum flavum, annulus fibrosus, and posterior dura. The subarachnoid space, which as in our patient is already compromised by a ventrally placed tumor, is further compromised by movement of the neck. The resulting pressure on or ischemia of the spinal cord may produce the dysesthesia. Our cases offer no clues to the age-old question of whether pathological stimulation or release of inhibition is the fundamental mechanism.

References


Received for publication September, 1969.
Send reprint requests to: Robert A. Beatty, M.D., Neurological Surgery, 40 South Clay Street, Hinsdale, Illinois 60521.